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Biotechnology and Disease Control in Animals: Social and Ethical Issues

150

Given the condition of the web of life on this planet after 10,000 years of agriculture and the consequent exponential growth of human population and human consumption patterns, do we need biotechnology and sustainable agriculture? The earth very much needs sustainable agriculture in the pragmatic sense, but whether or not sustainable agriculture needs biotechnology is an issue. There is a great enthusiasm about biotechnology, and the enthusiasts are promising much good. Well, I like enthusiasm as much as the next person, but let us see where it is coming from. For one thing this enthusiasm flows from the deep and ancient wheels of our civilization, a civilization that began when the Mesopotamians expanded their economy and their society by tending sheep and tilling barley a hundred centuries ago.

Almost ever since, we have placed the highest value on bringing nature under human control. It is almost a religion or pathological obsession. We should be aware of the past and control our enthusiasm for every powerful new tool that we come up with for controlling nature. I see parallels in biotechnology.

Biotechnology requires sophisticated tools and expertise which makes it expensive, limits its use, ownership, and control. This is the first and greatest social and ethical issues of all. With respect to disease control in animals, who will have this tool of biotechnology? More importantly, who will control it? Will it be all of us, the potential victims of some accident, some mistake or some misdirection? Or will it be

controlled by private interests for the private gain of those who because of the competition in the industry keep the technology as their patentable property and their goals and activities away from public view, (probably secret)?

These are serious political questions. It would be nice to assume that democracy and justice will prevail, but it would be stupid to make that assumption. When one considers the power of these technologies and the enthusiasm for them, and the quarters from which the enthusiasm is coming and the blindness that usually accompanies it, we might as well face the fact that we could already be on the wrong track with biotechnology.

What is the impact of biotechnology on the environment, on consumers, farming, and the animals on the farms? Biotechnology is being developed and applied for use in the areas of: diagnostic tests; products that will enable farmers to diagnose animal diseases quickly; immunization new vaccines against a wider range of afflictions and products for the regulation of animal immune systems and gene transfer and other genetic manipulations that are used to create strains of animals that have an enhanced immune response, disease resistance, and new antibiotics that work against a wider range of diseases.

151

DIAGNOSTIC TESTS

The new diagnostic tests could employ monoclonal antibody technology to make a product that a lay person (e.g., farmer) could use to make a rapid, on the spot diagnosis of animal disease. Like litmus paper, the product could be dipped into the animal's body fluid, and after processing, the farmer could determine what the disease was, or whether or not a disease agent was present. Whether or not such new diagnostic tests would create adverse social or ethical problems depends on how accurate they are, how they are used, and what sort of farms they give an advantage to.

On the positive side, diagnostic ability would give farmers a wider edge against diseases by allowing earlier and more specific treatment. With early detection, the effected animal or animals could be isolated sooner and could perhaps reduce the risk of infection to the rest of the herd. This would help the farmer follow a more sustainable agricultural strategy, by preventing disease rather than using powerful, dangerous drugs to eradicate disease after it has broken out. If the diagnostic tests are so employed, animals would benefit from a reduction in

diseases. Farmers would benefit in the reduction of veterinary costs and other overall herd health care costs. If the health of the herd is improved by a shift away from disease-busting drugs to prevention, then consumers would benefit from a reduction in the incidence or likelihood of toxins or drugs in the food chain.

If a products' diagnostic effectiveness does not live up to its advertiser's promises, what happens? The farmer is getting somewhat less of a diagnostic tool than he or she is counting on, and this could be a serious problem. An inferior diagnostic test in the hands of a less than conscientious farmer, could be a formula for disease disaster. The farmer would be relying on an easy diagnosis, an easy solution, and an easy management system. In such a situation, a disease outbreak could easily get out of hand by the time the farmer gets around to calling the veterinarian.

152

If the farmer misreads the directions or misuses the diagnostic test, then the farmer might administer something to the animal that might only make matters worse. The diagnostic might promise too much in the way of simple solutions for complex disease problems, and where disease is concerned, mistakes are often irreversible.

If a diagnostic test is inexpensive, it will be accessible to the farmers involved in LISA, low input sustainable agriculture. If a diagnostic test is expensive, it will be used more by the capital-intensive, larger, factory-type operations, and thus give them an edge over the rest of the farming spectrum. In this case, the product would aid an operation that would have an adverse impact on the environment, on consumers, and on family farms. If the price makes the diagnostic test accessible to lower income or lower input farmers, it could give these farmers an edge over the corporate animal factory. Such diagnostic tests would seem to be most applicable to the operations with the smaller herds and the smaller flocks, rather than to large operations with tens of thousands of animals. It would be impractical for a large-scale operation to test each individual animal.

ANIMAL IMMUNIZATION

Improved immunization in animals would emphasize disease prevention rather than disease control and would shift farmers away from using so many drugs. If the new vaccines and the new immune system regulators are cheap enough and easy to use, then they could aid sustainable agriculture with a low-cost way to control disease and parasites.

It is doubtful, however, that such powerful tools for disease control will be widely offered at low cost. The manufacturers of these products tend to recoup the years of research and development costs by setting high profit margins once the products are on the market. Once these high profit margins are in place, the pharmaceutical industry does not usually allow the prices to drop. It is not always true that competition brings the prices down, sometimes they stay up. It is more likely that the manufacturers would be designing vaccines and immune system regulators for the animal production systems at the larger end of the production scale.

Large operators would be the most likely target of new products, because they have more to offer an investor. Large operations have virtually taken over egg and poultry production, and they have been taking on an increasingly larger share of the hog and dairy production in the past few decades. These operations have disease problems of their own, and from the point of view of the manufacturer, these farms are better, larger, more affluent, more stable, better informed, and a better return on the investment of research and development money. It is difficult to imagine the agribusiness pharmaceutical industry investing a great deal of research and product development money in new vaccines and immune system regulators for the set of disease problems that are peculiar to low-input operations. Farmers using LISA are not big buyers, and the manufacturers are not likely to develop products that address their disease problems. It is likely, then, that the new vaccines and immune regulators will be designed primarily for the poultry, hog, and dairy industry where large numbers of animals are confined in a controlled environment. In this environment, disease problems are related to crowding, stress, and airborne disease agents. The constancy of these conditions, and the constancy of certain diseases makes large operations the most likely candidates for profitable product development, such as new antibiotic products and the new strains of specific disease-resistant animals.

GENETIC ENGINEERING

The genetic engineering of animals for specific disease resistance would probably have the most clear-cut impacts on farm structure. Because of the high investment of capital and expertise that is required to carry out the genetic alteration of animals, only the well capitalized firms will be able to successfully conduct these research programs and develop these products. For various reasons, these firms would be

likely to put high price tags on their products. The U.S. Supreme Court has recently supported the idea of patenting the products of this research, which would give a firm a monopoly over its creations. The firm would feel justified in recouping its research and development costs by charging a high price. Moreover, the purchasers of specific disease resistant animals would have to pay royalties or some kind of a premium for these special animals.

Additionally, the development of disease resistant animals may further reduce genetic diversity. Instead of actually preventing diseases, the narrowing of the gene pool might open up the animal industries to disease vulnerability.

ANIMAL WELFARE

154

At first glance, the new vaccines, antibiotics, immune system regulators, and disease resistant animals would seem to improve animal welfare. If an animal is disease free, then animal welfare is high, but this may not always be the case. There is more to animal welfare than the simple absence of disease. There are social, emotional, and psychological factors that generally do not concern producers unless they interfere with production.

If the architects of biotechnology are attempting to nullify, circumvent or override these factors so that an animal can produce despite the environment or living conditions provided, then all-around animal welfare will sink to the lowest common denominator. This trend has already been seen in controlled environment-intensive operations where a combination of isolation, subtherapeutic doses of antibiotics, and the use of potent drugs have made mass production profitable. Without these intensive management tools, controlled environments would probably produce nothing but disease outbreaks and dead animals.

What would happen if these environment-intensive operations obtain the tools from biotechnology? The confinement buildings could be filled with animals that are virtually disease proof, because of the new vaccines, the immune regulators, or disease resistant genes. Would it not be possible to sustain maximally profitable production under even more severe isolation, physical restriction, and crowding? Animal living conditions and animal stress could become even worse than they are now, and yet production would increase.

It is quite likely that animal welfare would worsen, because the new tools would increase overhead, which would have to be recovered through increased production. Production could be elevated, as it usually is, by increasing animal numbers, which could be accomplished without the previous restraint of disease induced by stress, crowding and other close-confinement conditions. If biotechnology is to take this direction and foster an increase in animal production, farm animals would not be the only ones to suffer the consequences. When animal production is dominated by mass production operations, there will be adverse impacts on consumers, the environment, and on the rest of the spectrum of farming.

IMPACT OF HIGH-INPUT INTENSIVE ANIMAL PRODUCTION SYSTEMS

The impacts of high-input intensive animal production systems on consumers, will cause a deterioration of the overall quality of the meat, milk, and eggs produced. The more extreme manipulations of genetics, growth cycles, and living conditions seems to produce animal products that are watery, flabby, bland, colorless, and artificial. This may be one of the factors behind the shift away from animal products in recent years.

155

There are increased human health risks that are attributable to the substitution of antibiotics and drugs for labor intensive animal care methods. Two hazards face the consumers of the factory animal product. There is the greater likelihood that an animal product may contain a residue of a toxic drug or chemical used in disease prevention. There is also an increased chance of contracting an animal-borne disease such as food poisoning from *Salmonella* which may have become resistant to one or more of the antibiotics routinely used in these large systems.

The huge confinement operations affect the environment by creating a constant odor problem; infestations of flies, mice, and other pests; as well as stream and groundwater pollution. Many of these operations are so specialized, that it is uneconomical or inconvenient to redistribute the animal wastes back onto the croplands. In some places, waste is dumped or contained in holding ponds or treated and added back into animal feeds. Thus, nitrogen and other valuable nutrients found in waste are not returned to the soil. This is certainly not a sustainable agricultural practice.

Factory facilities tend to require feeds that will store easily and move through the pipelines, augers, and other moving parts of automated feeding systems. These large operations also require feeds that will put weight on animals rather quickly, so they can move a large number of animals per year through their expensive buildings. They will use mostly grain concentrates and other high-protein feedstuffs. To furnish these in sufficient volume, corn, soybeans, and other feed crop farmers have had to resort to chemical fertilizers, pesticides, herbicides, and many other environmentally invasive high-input methods.

156

If biotechnology is geared towards the biggest operations and they take over production, there will also be an impact on farm structure. The impact is best illustrated by what has happened in the poultry business. Many a farm family used to make a decent living by producing chickens and eggs for local markets. Today, these poultry farmers are virtually all gone because pharmaceutical, grain, feed, and other well-capitalized companies replaced them with antibiotics, automation, and quick-grow chickens. Eggs, chickens, and turkeys are very cheap now, but at what cost to the environment, the farmers, the farm communities, and to the chickens themselves? The broiler chicken cannot even walk anymore. Now that is a small consideration when you figure that it is going to be eaten in seven weeks, but it is just another sign of the times. By quietly researching and developing biotechnological products before the impacts are known, those who have the greatest investments in the present modes of agricultural production could work to resist rather than to assist the increasing need for sustainable agriculture.

Consumers do not want cheap, bland, "plastic" animal products that have been mass produced; they want color, taste, quality, and purity in their foods. Even the supermarkets, who scoffed at carrying organic food five years ago, are now trying to get organic food on their shelves. Consumer demand, together with increasing public concern for the environment, could soon make sustainable agriculture very profitable.